Common Market for Eastern and Southern Africa

EDICT OF GOVERNMENT

COMESA 228 (2006) (English): Insulators for overhead lines with a nominal voltage above 1 000 V - Ceramic insulators for a.c. systems - Characteristics of insulator units of the long rod type

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COMESA HARMONISED STANDARD

COMESA/DHS 228: 2005

Insulators for overhead lines with a nominal voltage above 1 000 V - Ceramic insulators for a.c. systems - Characteristics of insulator units of the long rod type

REFERENCE: DHS 228: 2005

Foreword

The Common Market for Eastern and Southern Africa (COMESA) was established in 1994 as a regional economic grouping consisting of 20 member states after signing the co-operation Treaty. In Chapter 15 of the COMESA Treaty, Member States agreed to co-operate on matters of standardisation and Quality assurance with the aim of facilitating the faster movement of goods and services within the region so as to enhance expansion of intra-COMESA trade and industrial expansion.

Co-operation in standardisation is expected to result into having uniformly harmonised standards. Harmonisation of standards within the region is expected to reduce Technical Barriers to Trade that are normally encountered when goods and services are exchanged between COMESA Member States due to differences in technical requirements. Harmonized COMESA Standards are also expected to result into benefits such as greater industrial productivity and competitiveness, increased agricultural production and food security, a more rational exploitation of natural resources among others.

COMESA Standards are developed by the COMESA experts on standards representing the National Standards Bodies and other stakeholders within the region in accordance with international procedures and practices. Standards are approved by circulating Final Draft Harmonized Standards (FDHS) to all member states for a one Month vote. The assumption is that all contentious issues would have been resolved during the previous stages or that an international or regional standard being adopted has been subjected through a development process consistent with accepted international practice.

COMESA Standards are subject to review, to keep pace with technological advances. Users of the COMESA Harmonized Standards are therefore expected to ensure that they always have the latest version of the standards they are implementing.

This COMESA standard is technically identical to the International Standard *IEC 60433:1998.*

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60433

Troisième édition
Third edition
1998-08

Isolateurs pour lignes aériennes de tension nominale supérieure à 1 000 V – Isolateurs céramiques pour systèmes à courant alternatif – Caractéristiques des éléments de chaînes d'isolateurs à fût long

Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic insulators for a.c. systems – Characteristics of insulator units of the long rod type

Numéro de référence
Reference number
CEI/IEC 60433:1998

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INSULATORS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE ABOVE 1 000 V –

Ceramic insulators for a.c. systems –

Characteristics of insulator units of the long rod type

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60433 has been prepared by subcommittee 36B: Insulators for overhead lines, of IEC technical committee 36: Insulators.

This third edition cancels and replaces the second edition published in 1980 and constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
36B/180/FDIS	36B/184/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

INSULATORS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE ABOVE 1 000 V –

Ceramic insulators for a.c. systems –

Characteristics of insulator units of the long rod type

1 Scope

This International Standard is applicable to string insulator units of the long rod type with insulating parts of ceramic material intended for use in a.c. overhead power lines with a nominal voltage greater than 1 000 V and a frequency not greater than 100 Hz. It is also applicable to insulators of similar design, used in substations.

This standard is applicable to ceramic string insulator units of the long rod type, either with a clevis end fitting at both ends for coupling with a tongue, or with a socket end fitting at both ends for coupling with a pin ball.

The object of this standard is to prescribe specified values for electrical and mechanical characteristics, and for the principal dimensions of ceramic string insulator units of the long rod type.

This standard is applicable to string insulator units for use on overhead lines situated in lightly polluted areas, and the creepage distances given in table 1 have been established accordingly, using the IEC 60815 recommendation of 16 mm/kV for pollution level I. However, shorter creepage distances may be used in some non-polluted areas. If specific operating conditions require or allow non-standard (longer or shorter) creepage distances, the mechanical characteristics as well as the lengths *L* (see clause 4) of this standard should be used unless the need for exceptionally long creepage distances requires values of *L* greater than those given in table 1. In the case of special requirements, e.g. very heavy polluted areas and for other particular or extreme environmental conditions, it may be necessary for certain dimensions to be changed.

NOTES

1 As far as reasonably applicable, this International Standard may also be applied to similar insulator units outside the scope of this standard, such as insulators for electric traction lines.

2 This International Standard does not include tests on insulators and dimensions of end fittings.

3 Ball and socket couplings are covered by IEC 60120, clevis and tongue couplings by IEC 60471.

4 For the definition of pollution levels, see IEC 60815.

5 The term "ceramic" is used in this International Standard to refer to porcelain materials and, contrary to North American practice, does not include glasses.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60071-1:1993, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60120:1984, *Dimensions of ball and socket couplings of string insulator units*

IEC 60383-1:1993, *Insulators for overhead lines with a nominal voltage above 1 000 V – Part 1: Ceramic or glass insulator units for a.c. systems – Definitions, test methods and acceptance criteria*

IEC 60471:1977, *Dimensions of clevis and tongue couplings of string insulator units*

IEC 60672-1:1995, *Ceramic and glass insulating materials – Part 1: Definitions and classification*

IEC 60672-3:1997, *Ceramic and glass insulating materials – Part 3: Specification for individual materials*

IEC 60815:1986 *Guide for the selection of insulators in respect of polluted conditions*

3 Definition

For the purposes of this International Standard, the following definition applies:

3.1
long rod insulator
suspension or tension insulator consisting of an approximately cylindrical insulating part provided with sheds and equipped at the ends with external metal fittings

The insulator is designed in such a manner that the shortest puncture path through solid insulating material is at least equal to half the arcing distance. Therefore it is a class A insulator according to IEC 60383-1.

4 Characteristics

String insulator units of the long rod type are characterised by the following specified characteristics:

– the standard lightning impulse withstand voltage (see IEC 60071-1);
– the wet power frequency withstand voltage (see IEC 60071-1);
– the tensile mechanical failing load;
– the maximum nominal length *L* of the insulator;
– the maximum nominal diameter *D* of the insulating part ;
– the minimum nominal creepage distance;
– the standard coupling.

The corresponding values are specified in table 1. The minimum nominal creepage distances are based on a specific creepage distance of 16 mm/kV for the lowest value of the highest voltage for equipment corresponding to the specified value of the standard lightning impulse withstand (in accordance with IEC 60071-1).

NOTES

1 The tolerances given in IEC 60383-1 are applicable to all the dimensions in table 1, even if the adjectives "minimum" or "maximum" are used before the term "nominal".

2 Dry lightning impulse withstand voltage and wet power frequency withstand voltage are specified in table 1 for single unit string insulators. Values of withstand voltages of insulator strings consisting of more than one unit are not contained in this standard.

3 The rod diameter is not specified since it depends on the mechanical characteristics of the insulating material. Information on the definition and classification of ceramic insulating materials can be found in IEC 60672-1 and IEC 60672-3.

5 Designation and marking

Long rod insulators are designated in table 1 by letter L, followed by a figure indicating the specified mechanical failing load in kilonewtons. Then follows the letters B or C indicating ball and socket or clevis and tongue coupling respectively, followed by the value of the lightning impulse withstand voltage in kilovolts.

Example:

L 160 B 550 indicates:

- L: long rod insulator;
- 160: specified mechanical failing load, tension, 160 kN;
- B: ball and socket coupling;
- 550: dry lightning impulse withstand voltage 550 kV.

The insulators shall be marked either on the upper shed or on the metal parts with the name or trade mark of the manufacturer and the year of manufacture. In addition, each unit shall be marked with the specified mechanical failing load, by using the first part of the designation; for instance, the insulator shall be marked L 160 for the units with 160 kN specified mechanical failing load.

These markings shall be legible and indelible.

Figure 1 shows a long rod insulator with clevis couplings, figure 2 shows a long rod insulator with socket couplings.

Table 1 – Specified values for long rod insulators

Designation	Standard lightning impulse withstand voltage	Wet power frequency withstand voltage	Specified mechanical failing load	Maximum nominal diameter *D* on the insulating part	Minimum nominal creepage distance (16 mm/kV, see clause 4)	Coupling B		Coupling C	
						Maximum nominal length *L*	Standard coupling size (pin diameter, see IEC 60120)	Maximum nominal length *L*	Standard coupling size (coupling pin diameter, see IEC 60471 – non-preferred sizes in brackets)
	kV	kV	kN	mm	mm	mm		mm	
L 40 B/C 170	170	70	40	160	576	380	11	400	13L
L 60 B/C 170	170	70	60	160	576	400	11	420	13L
L 100 B/C 170	170	70	100	180	576	450	16	475	19L (16L)
L 100 B/C 250	250	95	100	180	832	580	16	605	19L (16L)
L 100 B/C 325	325	140	100	180	1 160	870	16	900	19L (16 L)
L 100 B/C 450	450	185	100	180	1 968	1 085	16	1 120	19L (16L)
L 100 B/C 550	550	230	100	180	1 968	1 240	16	1 270	19L (16L)
L 120 B/C 325	325	140	120	200	1 160	870	16	905	19L (16L)
L 120 B/C 450	450	185	120	200	1 968	1 085	16	1 120	19L (16L)
L 120 B/C 550	550	230	120	200	1 968	1 240	16	1 275	19L (16L)
L 120 B/C 650	650	275	120	200	2 320	1 430	16	1 465	19L (16L)
L 160 B/C 325	325	140	160	210	1 160	885	20	920	19L
L 160 B/C 450	450	185	160	210	1 968	1 100	20	1 135	19L
L 160 B/C 550	550	230	160	210	1 968	1 255	20	1 290	19L
L 160 B/C 650	650	275	160	210	2 320	1 445	20	1 465	19L
L 210 B/C 325	325	140	210	220	1 160	905	20	940	22L
L 210 B/C 450	450	185	210	220	1 968	1 120	20	1 155	22L
L 210 B/C 550	550	230	210	220	1 968	1 275	20	1 310	22L
L 210 B/C 650	650	275	210	220	2 320	1 465	20	1 500	22L
L 250 B/C 550	550	230	250	230	1 968	1 305	24	1 335	22L
L 250 B/C 650	650	275	250	230	2 320	1 500	24	1 530	22L
L 300 B/C 550	550	230	300	240	1 968	1 330	24	1 365	25L
L 300 B/C 650	650	275	300	240	2 320	1 520	24	1 560	25L
L 330 B/C 550	550	230	330	250	1 968	1 360	28	1 400	28L
L 330 B/C 650	650	275	330	250	2 320	1 550	28	1 595	28L
L 360 B/C 550	550	230	360	250	1 968	1 360	28	1 410	28L
L 360 B/C 650	650	275	360	250	2 320	1 550	28	1 600	28L
L 400 B/C 550	550	230	400	260	1 968	1 400	28	1 460	28L
L 400 B/C 650	650	275	400	260	2 320	1 600	28	1 660	28L
L 530 B/C 550	550	230	530	270	1 968	1 450	32	1 520	32L
L 530 B/C 650	650	275	530	270	2 320	1 650	32	1 720	32L

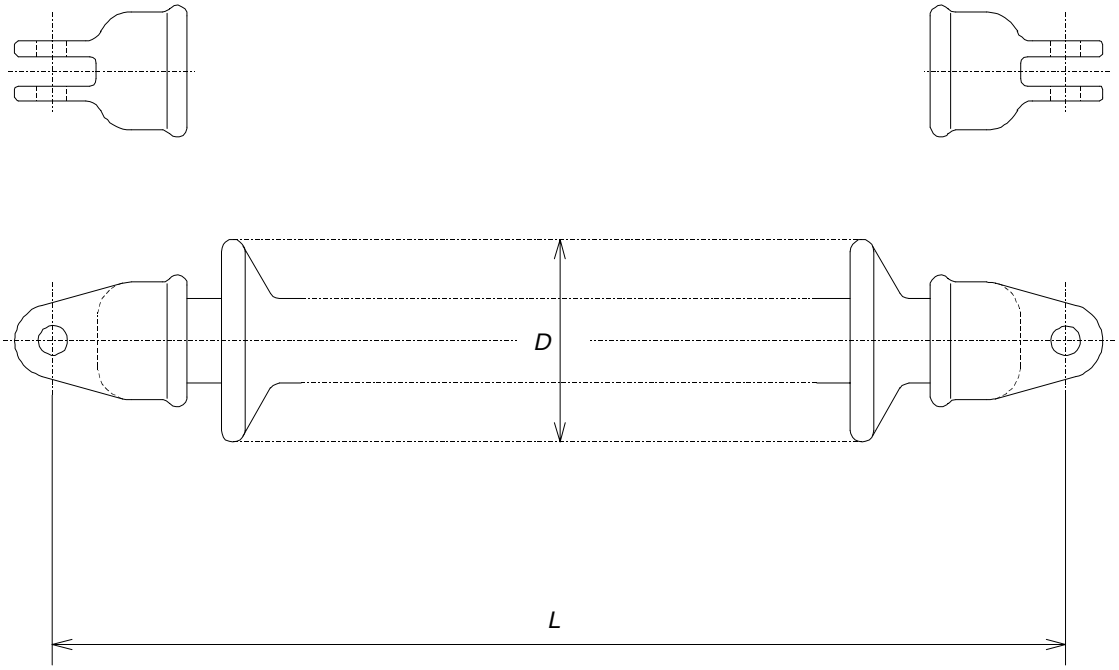

Figure 1 – Long rod insulator with clevis couplings, type C

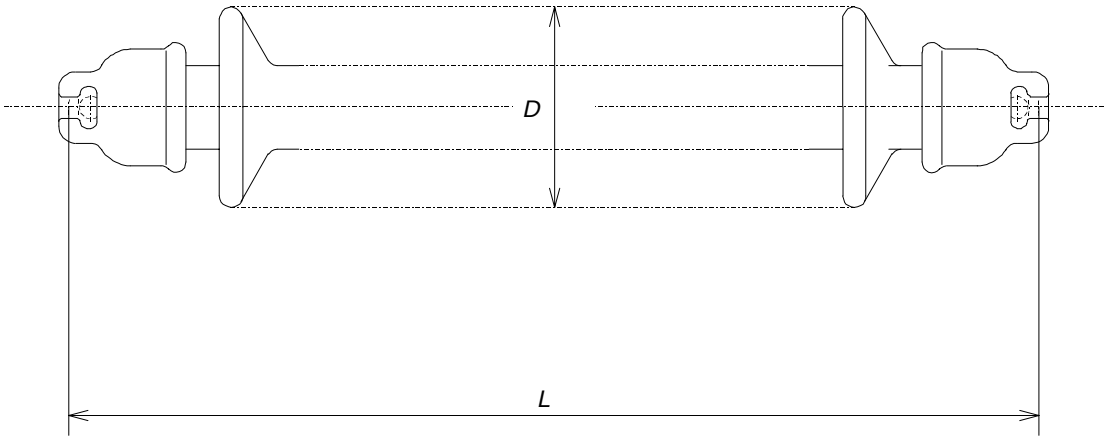

Figure 2 – Long rod insulator with socket couplings, type B

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